

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : TOSHIBA CORP

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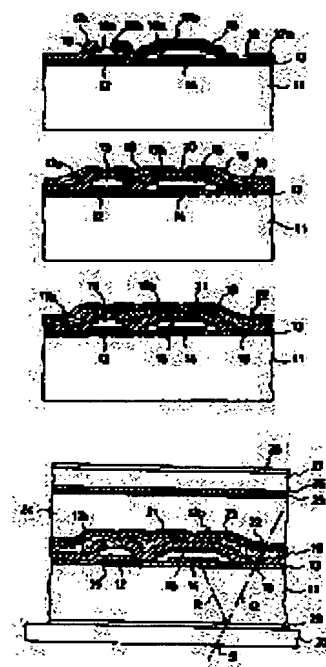
(72)Inventor : TAYA AKIRA
HARADA NOZOMI
OANA YASUHISA
OGI KEISUKE
IZAWA KOJI
SAKAMOTO MASANORI

(54) OPTICAL SOLID DEVICE

(57)Abstract:

PURPOSE: To provide one cell with three functions, i.e. a display, the pick-up of images and a hard copy, and to miniaturize and lighten the titled device and reduce its cost by using a transparent substrate, on the back thereof a non-reflection film is formed, as a substrate while forming materials for a channel section in a transistor, a dielectric layer in a capacitor, etc. by photoconductive films.

CONSTITUTION: A second conductor film 14 consisting of a transparent conductor such as In_2O_3 is formed selectively on an insulating film 13. The whole surface is coated with a conductor film, and third conductor films 17a, 17b are formed through patterning while a first window section 18 for transmitting beams is shaped. The whole surface is coated with a second insulating film (a transparent insulating layer) 19 consisting of a transparent material, and a contact hole 20 is formed on the third electrode 17b. The whole surface is coated with a fourth conductor film (an opaque conductor layer) 21, and a second window section 22 for transmitting beams is formed. A first orientation layer 23, a liquid crystal layer 24, a second orientation layer 25, a fifth conductor film 26, a glass plate and a polarizing layer 28 are laminated and formed in this order, and the lower surface of a substrate 11 is coated with an optical antireflection film 29, thus obtaining a solid cell.



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Machine
Translation

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(71)Applicant : SHARP CORP

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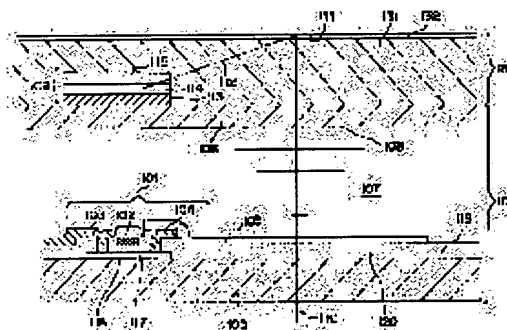
(72)Inventor : ITO MASATAKA
MORITA TATSUO
TSUCHIMOTO SHUHEI

(54) DEVICE AND METHOD FOR IMAGE INPUT AND OUTPUT

(57)Abstract:

PURPOSE: To reduce the size of the image input/output device and also simplify its constitution by constituting the image input/output device which has its image display part and image input part in one body.

CONSTITUTION: The image display part 10 is constituted by providing specific-pattern transparent electrodes 105 and 108, constituting pixels 120, on the internal surfaces of a couple of transparent substrates 100 and 106 between which liquid crystal 107 is sandwiched. Further, the image input part 20 is constituted by providing a specific-pattern photodetection layer 109 which receives and converts light into an electric signal and transparent layers 131 and 132 which protect the photodetection layer 109 on the external surface of one transparent substrate 106 of the image display part 10. The photodetection layer 109 is provided at a place corresponding to the gaps of the pixels 120.



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09.10.1998

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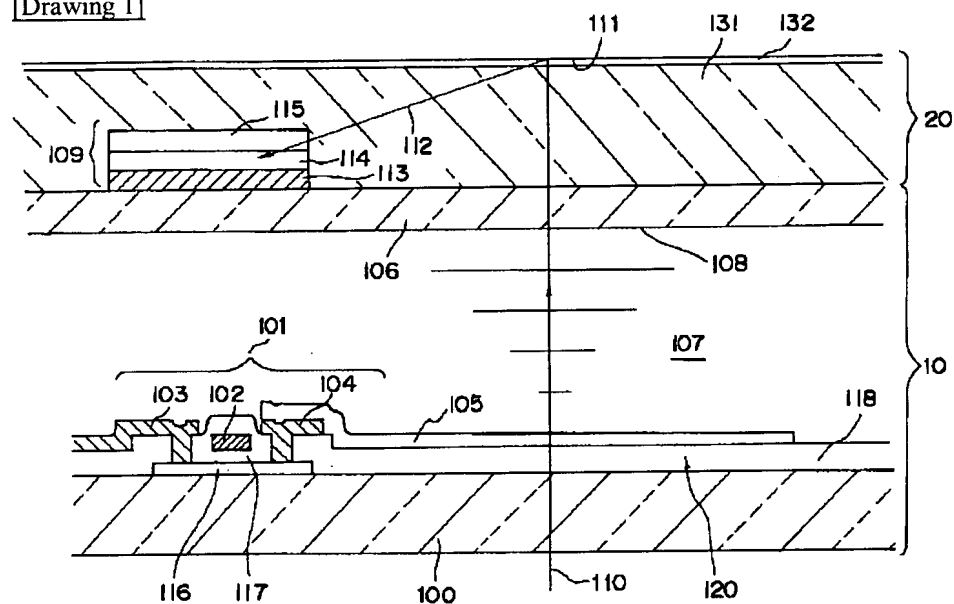
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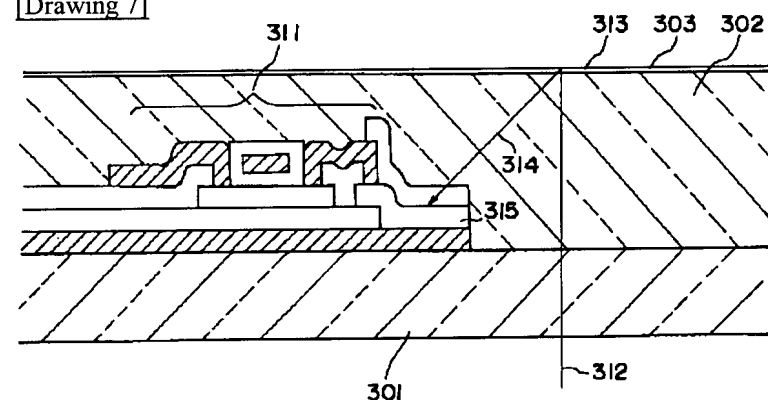
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DRAWINGS

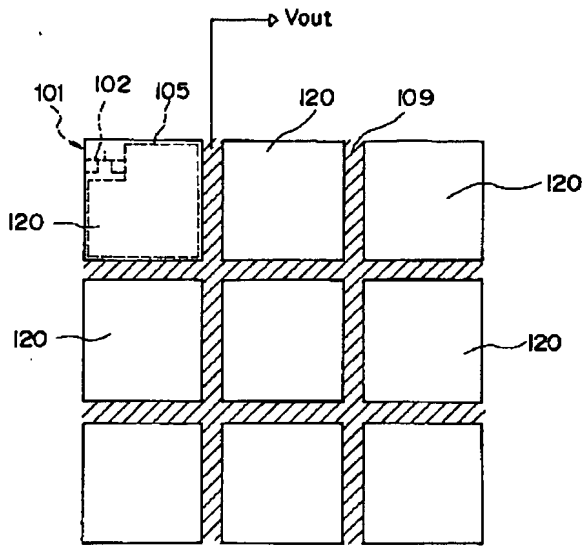
[Drawing 1]



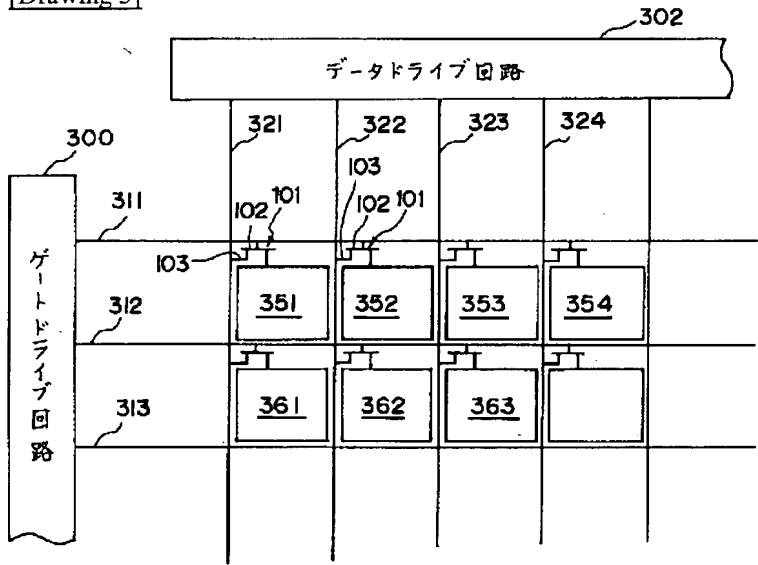
[Drawing 7]



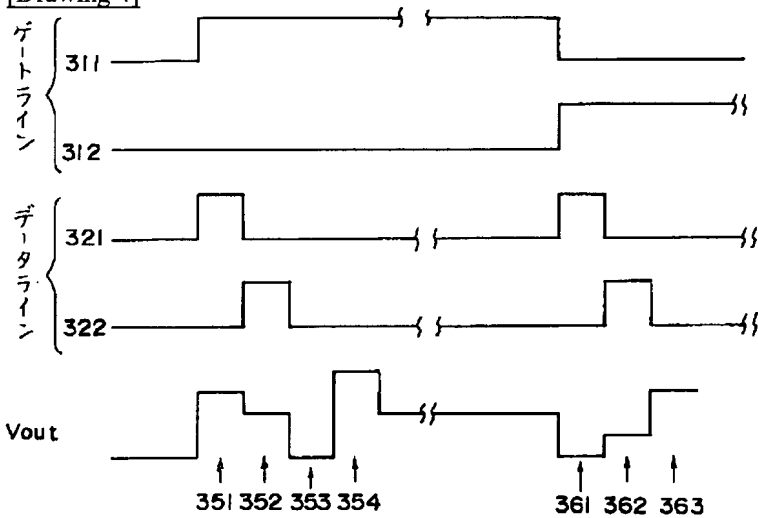
[Drawing 2]



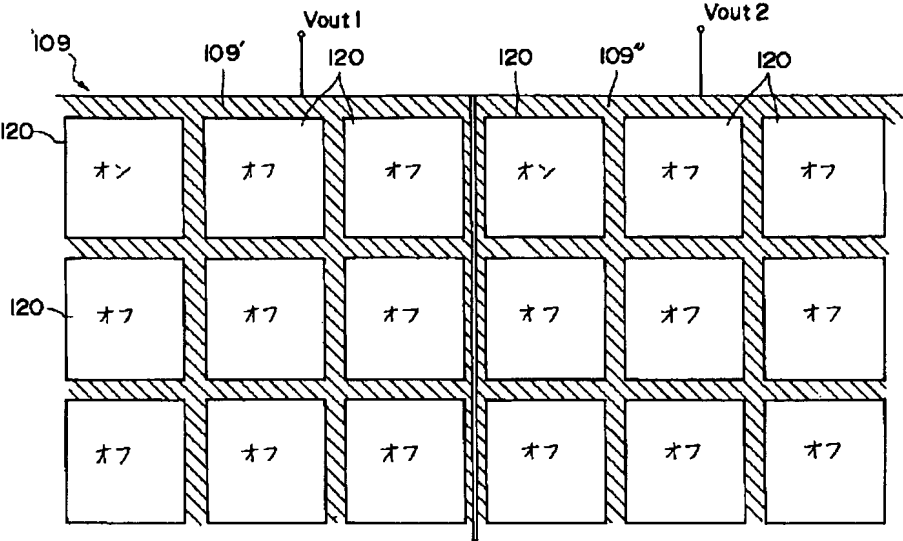
[Drawing 3]



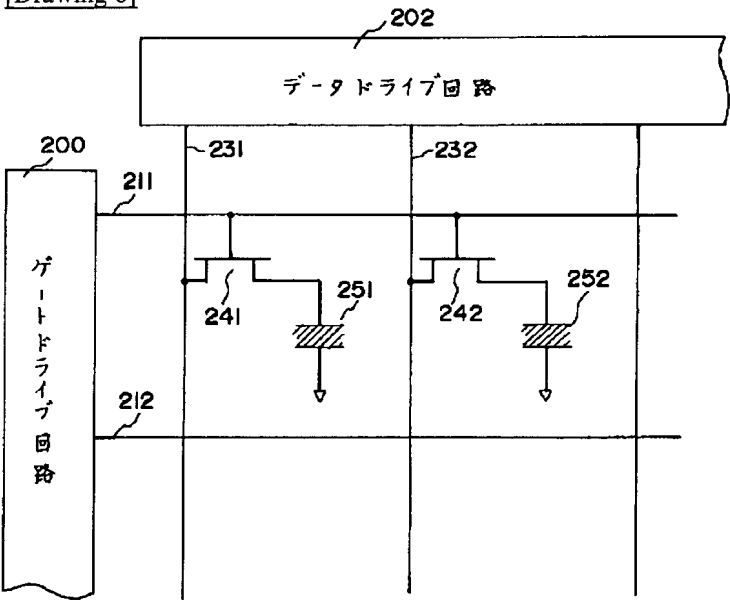
[Drawing 4]



[Drawing 5]



[Drawing 6]



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the equipment and the method of displaying a picture image and reading a picture image in detail about a picture image I/O device and technique.

[0002]

[Description of the Prior Art] Conventionally, as image display equipment, as shown in drawing 6, active matrix liquid crystal display is known. Active matrix liquid crystal display constitutes each pixel with the liquid crystal sections 251 and 252 and -- combining TFT (TFT) 241 and 242 and every one --. At the time of an operation, TFT is made to turn on and off for every line through the gate lines 211 and 212 and -- by the gate drive circuit 200, and it displays on each liquid crystal sections 251 and 252 and -- by writing in data (voltage) one by one through data lines 231 and 232 and -- by the data drive circuit 202.

[0003] On the other hand, the contact type image sensor is known as a picture input device. A contact type image sensor constitutes a 1-dimensional sensor array in a size equal to a manuscript, and detects the reflected light from a manuscript by each sensor. In this contact type image sensor, when reading a two-dimensional manuscript, it is necessary to scan a manuscript or a sensor mechanically in the orientation perpendicular to a sensor array. Then, as what can omit the time of this scanning, as shown in drawing 7, what formed the light-receiving layer 315 and TFT311 in the shape of a matrix on the transparent substrate 301 is proposed (drawing, since it is easy, only 1 set is shown.). 302 is transparent protection layer and 303 is a sheet glass. In this picture input device, the irradiation light 312 is made to irradiate a manuscript 313 from the transparent substrate 301 side, and the reflected light 314 is detected in the light-receiving layer 315. The signal which the light-receiving layer 315 detected is taken out as a time series signal by the scanning circuit which does not let pass and illustrate TFT311. [0004] Thus, image display and the picture image input were conventionally performed by respectively another equipment. For example, in a work station and a personal computer, a display, and an image reader and a scanner are isolated systems, and are separately connected through an interface.

[0005]

[Problem(s) to be Solved by the Invention] By the way, a miniaturization of a computer progresses and to be compact also about the picture image I/O device of the circumference is demanded in recent years. However, there is a problem that a miniaturization is difficult, in the status that image display and a picture image input are performed by separate equipment as stated above. Moreover, a scanning circuit must be prepared in each equipment and there is a problem that the configuration of equipment cannot be simplified. Especially in the case of two-dimensional image sensors, the configuration of equipment is complicated in order to have to form the optical system (lens etc.) for having to scan the light-receiving layer separated for every pixel, and irradiating a manuscript.

[0006] Then, the purpose of this invention is to offer the picture image I/O device and technique of simplifying the configuration of equipment while it unifies the image display section and the picture image input section and miniaturizes equipment.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the picture image I/O device of this invention It is the picture image I/O device which combined the image display section and the picture image input section with one. the above-mentioned image display section The transparent electrode of the predetermined pattern which constitutes a pixel in the internal surface of parietal bone of the transparent substrate of the couple which pinches liquid crystal is prepared. It responds to the applied voltage to the above-mentioned transparent electrode, and the light which carried out incidence to the abbreviation perpendicular from the outside of the above-mentioned transparent substrate is penetrated or intercepted for every above-mentioned pixel. the above-mentioned picture image input section The light-receiving layer of a predetermined pattern convertible into an electrical signal in response to light at the superficies of the transparent substrate by the side of the optical outgoing radiation of the above-mentioned image display section, The stratum lucidum which protects this light-receiving layer is prepared, and it is characterized by detecting the light reflected among the light which the above-mentioned image display section penetrated by the manuscript near [above-mentioned] the transparency layer front face.

[0008] Moreover, as for the above-mentioned light-receiving layer of the above-mentioned picture image input section, it is desirable to be prepared in the part equivalent to the opening between the pixels of the above-mentioned image display section.

[0009] Moreover, while the picture image I/O technique of this invention equips the internal surface of parietal bone of the transparent substrate of the couple which pinches liquid crystal with the image display section which prepared the transparent electrode of the predetermined pattern which constitutes a pixel The light-receiving layer of a predetermined pattern convertible into an electrical signal in response to light at the superficies of one transparent substrate of the above-mentioned image display section, When performing image display using a picture image I/O device equipped with the picture image input section which prepared the stratum lucidum which protects this light-receiving layer When an abbreviation perpendicular is made to carry out incidence of the light to the above-mentioned image display section from the above-mentioned picture image input section and

an opposite side, it responds to the applied voltage to the above-mentioned transparent electrode, this light is penetrated or intercepted for every above-mentioned pixel and a picture image input is performed. A manuscript is made to approach the above-mentioned stratum-lucidum front face of the above-mentioned picture image input section, and it is characterized by detecting the light reflected by the above-mentioned manuscript among the light which the above-mentioned image display section penetrated according to the applied voltage to the above-mentioned transparent electrode by the above-mentioned light-receiving layer of the above-mentioned picture image input section. [0010]

[Function] According to this invention, since the image display section and the picture image input section are constituted by one, equipment is miniaturized. Moreover, since it is communalized in the image display section and the picture image input section and the scanning circuit can be managed with one, the configuration of equipment is simplified.

[0011] Moreover, when the light-receiving layer of the above-mentioned picture image input section is prepared in the part equivalent to the opening which is the pixel of the above-mentioned image display section, the above-mentioned light-receiving layer does not interrupt the light which penetrated the image display section. Therefore, the contrast of image display and a picture image input increases.

[0012] In addition, each pixel is chosen by the image display section at the time of a picture image input. Therefore, it is not necessary to separate the light-receiving layer of the picture image input section for every pixel. Moreover, at the time of a picture image input, since it reads by making a manuscript approach the stratum-lucidum front face of the picture image input section, it is not necessary to form optical system, such as a lens.

[0013]

[Example] Hereafter, an example explains the picture image I/O device and technique of this invention in detail. Drawing 1 and the drawing 2 show the cross-section structure and the outline pattern of a picture image I/O device of one example, respectively. As shown in drawing 1, this picture image I/O device consists of the image display section (active matrix liquid crystal display device) 10 and the picture image input section 20.

[0014] The above-mentioned image display section 10 has the transparent electrode (it consists of ITO (tin addition indium oxide)) 105, 108 of the predetermined pattern which constitutes a pixel 120 in the internal surface of parietal bone of the transparent substrate 100, 106 of the couple which pinches a ferroelectric liquid crystal 107. Moreover, TFT (TFT) 101 is formed in the internal surface of parietal bone of the transparent substrate 100 every pixel 120. TFT101 consists of the channel layer 116 which consists of polycrystal silicon, the gate insulator layer 117, the gate electrode 102, a source electrode 103, and a drain electrode (it connects with the transparent electrode 105) 104. 118 is an insulating layer.

[0015] As shown in drawing 3, the gate drive circuit 300 and the data drive circuit 302 are established in this image display section 10 like the conventional LCD. That is, while a gate drive circuit 300 is connected to the gate electrode 102 of each TFT101 through the gate lines 311 and 312 and --, the data drive circuit 302 is connected to the source electrode 103 of each TFT through data lines 321 and 322 and --.

[0016] Moreover, as shown in drawing 1, the above-mentioned picture image input section 20 is the superficies of the above-mentioned transparent substrate 106 from the light-receiving layer 109 changed into an electrical signal in response to light, and the stratum lucidum (the transparent protection layer 131 and sheet glass 132) which protects this light-receiving layer 109. The above-mentioned light-receiving layer 109 consists of three layers of the lower electrode 113 which can interrupt light, the semiconductor layer 114 which performs a photo electric translation, and the transparent up electrode 115, and as shown in drawing 2, it is formed in the opening between each pixel 120 in the shape of a grid. After carrying out the laminating of the three above-mentioned layers to the whole surface, while removing the fraction on each pixel 120 among the three above-mentioned layers in fact, it has left the fraction on the gate lines 311 and 312 shown in view 3 among the three above-mentioned layers, -- and the data lines 321 and 322, and --. It is for raising contrast at the time of an operation, as the light for a display or reading is not interrupted.

[0017] Thus, since this picture image I/O device constitutes the image display section 10 and the picture image input section 20 in one, it can miniaturize equipment as compared with the case where it constitutes separately.

[0018] When performing image display, an abbreviation perpendicular is made to carry out incidence of the light (the so-called back light) 100 to the image display section 10 shown in drawing 1 from the transparent substrate 100 side like the conventional LCD, it responds to the applied voltage to the above-mentioned transparent electrode 105, 108, and this light 100 is penetrated or intercepted every pixel 120. Namely, TFT is made to turn on and off for every line through the gate lines 311 and 312 and -- by the gate drive circuit 300 shown in drawing 3, and it displays on each liquid crystal sections (pixel) 351 and 352 and -- by writing in data one by one through data lines 321 and 322 and -- by the data drive circuit 302.

[0019] When performing a picture image input, a manuscript 111 is made to approach sheet-glass 132 front face of the picture image input section 20, as shown in drawing 1. And the light-receiving layer 109 detects the light 112 reflected by the above-mentioned manuscript 111 among the light 110 which the image display section 10 penetrated according to the applied voltage to a transparent electrode 105, 108. For example, as shown in drawing 4, the voltage of a high level is impressed to the gate line 311 shown in drawing 3, and it is made to turn on TFT101 of the 1st line. In this status, the voltage pulse of a high level is first impressed to a data line 321. The pixel 351 of the 1st line 1st train shown in drawing 3 turns on by this, and light 110 is irradiated by the part (right above section) equivalent to the pixel 351 of a manuscript 111. At this time, the light 112 reflected by the manuscript 111 is detected by the light-receiving layer 109, and as shown in drawing 4, it is taken out as output Vout. Next, the voltage pulse of a high level is impressed to a data line 322. And light 110 is irradiated at the right above section of the pixel 352 of a manuscript 111, and output Vout of the light-receiving layer 109 is taken out. After the 1st-line scanning finishes, the same procedure performs the 2nd-line scanning. Thus, as a pixel 351 and a time series signal corresponding to the scanning of --, the light-receiving section 109 can be taken out output Vout, and the picture image of the manuscript 111 whole can be read.

[0020] It is communalized in the image display section 10 and the picture image input section 20, and the scanning circuit 300, 302 can be managed with this picture image I/O device one. Therefore, the configuration of equipment can be simplified as

compared with the case where separate equipment performs image display and a picture image input.

[0021] In addition, the part which is equivalent to each pixel of a manuscript 111 with the image display section 10 is chosen at the time of a picture image input. Therefore, it is not necessary to separate the light-receiving section 109 of the picture image input section 20 for every pixel.

[0022] Moreover, at the time of a picture image input, since it reads by making a manuscript 111 approach sheet-glass 132 front face of the picture image input section 20 as shown in drawing 1, it is not necessary to form optical system, such as a lens.

[0023] If distance of a manuscript 111 and the light-receiving section 109 is narrowed too much while the irradiation light 110 will spread and resolution will fall, if the distance of a manuscript 111 and the light-receiving section 109 is extended, the reflected light 112 will stop going into the light-receiving section 109, and an S/N ratio will fall. In this example, in order that the breadth angle of the irradiation light 110 might obtain 8 dots/mm resolution at about 90 degrees, thickness of a stratum lucidum 131,132 was set to about 100 micrometers.

[0024] The 10 inches screen (1627x1219 pixels) was actually able to be read in 20 seconds with 8 dots/mm resolution with this picture image I/O device at the speed for 10 microseconds per pixel.

[0025] In addition, in this example, although the light-receiving layer 109 of the picture image input section 10 was used as the pattern which continues in the shape of a grid over the whole surface of the transparent substrate 106, it is not restricted to this. When the speed of response of liquid crystal is not not much quick, as shown in drawing 5, the light-receiving layer 109 is divided into block 109' of a plurality (here two), and 109", and it may be made to take out outputs Vout1 and Vout2 every [each block 109' and] 109". When it does in this way, a reading scanning can be performed in parallel by each block 109' and 109", and a total scan time can be shortened. When it divides into n blocks, a scan time can be shortened to 1/n.

[0026] Moreover, in this example, although the image display section 10 considers as an active matrix liquid crystal display device, it is not restricted to this with natural, and it is good also as a liquid-crystal-display element of other types.

[0027]

[Effect of the Invention] So that clearly as mentioned above, the picture image I/O device of this invention It is the picture image I/O device which combined the image display section and the picture image input section with one. the above-mentioned image display section The transparent electrode of the predetermined pattern which constitutes a pixel in the internal surface of parietal bone of the transparent substrate of the couple which pinches liquid crystal is prepared. It responds to the applied voltage to the above-mentioned transparent electrode, and the light which carried out incidence to the abbreviation perpendicular from the outside of the above-mentioned transparent substrate is penetrated or intercepted for every above-mentioned pixel. the above-mentioned picture image input section The light-receiving layer of a predetermined pattern convertible into an electrical signal in response to light at the superficies of the transparent substrate by the side of the optical outgoing radiation of the above-mentioned image display section, The stratum lucidum which protects this light-receiving layer is prepared, and since the light reflected among the light which the above-mentioned image display section penetrated by the manuscript near above-mentioned] the transparency layer front face is detected, equipment can be miniaturized as compared with the case where image display equipment and a picture input device are used as another field. Moreover, since it is communalized in the image display section and the picture image input section and a scanning circuit can be managed with one, the configuration of equipment can be simplified.

[0028] Moreover, when the light-receiving layer of the above-mentioned picture image input section is prepared in the part equivalent to the opening which is the pixel of the above-mentioned image display section, it can prevent that the above-mentioned light-receiving layer interrupts the light which penetrated the image display section, therefore the contrast of image display and a picture image input can be raised.

[0029] Moreover, while the picture image I/O technique of this invention equips the internal surface of parietal bone of the transparent substrate of the couple which pinches liquid crystal with the image display section which prepared the transparent electrode of the predetermined pattern which constitutes a pixel The light-receiving layer of the predetermined pattern changed into an electrical signal in response to light at the superficies of one transparent substrate of the above-mentioned image display section, When performing image display using a picture image I/O device equipped with the picture image input section which prepared the stratum lucidum which protects this light-receiving layer An abbreviation perpendicular is made to carry out incidence of the light to the above-mentioned image display section from the above-mentioned picture image input section and an opposite side. When it responds to the applied voltage to the above-mentioned transparent electrode, this light is penetrated or intercepted for every above-mentioned pixel and picture image reading is performed Since the above-mentioned light-receiving layer of the above-mentioned picture image input section detects the light reflected by the above-mentioned manuscript among the light which the manuscript was made to approach the above-mentioned stratum-lucidum front face of the above-mentioned picture image input section, and the above-mentioned image display section penetrated according to the applied voltage to the above-mentioned transparent electrode As compared with the case where the equipment of another field performs image display and a picture image input, small equipment can perform image display and a picture image input. Moreover, it can have by one scanning circuit and image display and a picture image input can be performed.

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] It is the picture image I/O device which combined the image display section and the picture image input section with one. the above-mentioned image display section The transparent electrode of the predetermined pattern which constitutes a pixel in the internal surface of parietal bone of the transparent substrate of the couple which pinches liquid crystal is prepared. It responds to the applied voltage to the above-mentioned transparent electrode, and the light which carried out incidence to the abbreviation perpendicular from the outside of the above-mentioned transparent substrate is penetrated or intercepted for every above-mentioned pixel. the above-mentioned picture image input section The light-receiving layer of a predetermined pattern convertible into an electrical signal in response to light at the superficies of the transparent substrate by the side of the optical outgoing radiation of the above-mentioned image display section, The picture image I/O device characterized by detecting the light reflected by the manuscript near [above-mentioned] the transparency layer front face among the light which the stratum lucidum which protects this light-receiving layer is prepared, and the above-mentioned image display section penetrated.

[Claim 2] The above-mentioned light-receiving layer of the above-mentioned picture image input section is a picture image I/O device according to claim 1 characterized by being prepared in the part equivalent to the opening between the pixels of the above-mentioned image display section.

[Claim 3] While the internal surface of parietal bone of the transparent substrate of the couple which pinches liquid crystal is equipped with the image display section which prepared the transparent electrode of the predetermined pattern which constitutes a pixel The light-receiving layer of the predetermined pattern changed into an electrical signal in response to light at the superficies of one transparent substrate of the above-mentioned image display section, When performing image display using a picture image I/O device equipped with the picture image input section which prepared the stratum lucidum which protects this light-receiving layer An abbreviation perpendicular is made to carry out incidence of the light to the above-mentioned image display section from the above-mentioned picture image input section and an opposite side. When it responds to the applied voltage to the above-mentioned transparent electrode, this light is penetrated or intercepted for every above-mentioned pixel and picture image reading is performed The picture image I/O technique characterized by detecting the light reflected by the above-mentioned manuscript among the light which the manuscript was made to approach the above-mentioned stratum-lucidum front face of the above-mentioned picture image input section, and the above-mentioned image display section penetrated according to the applied voltage to the above-mentioned transparent electrode by the above-mentioned light-receiving layer of the above-mentioned picture image input section.

[Translation done.]